



RAJALAKSHMI ENGINEERING COLLEGE CURRICULUM AND SYLLABUS

B. E. COMPUTER SCIENCE AND DESIGN REGULATION 2019

Vision

To promote highly Ethical and Innovative Computer Professionals through excellence in teaching, training and research.

Mission

- To produce globally competent professionals, motivated to learn the emerging technologies and to be innovative in solving real world problems.
- To promote research activities amongst the students and the members of faculty that could benefit the society.
- To impart moral and ethical values in their profession.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: To equip students with essential background in computer science, basic electronics and applied mathematics.

PEO 2: To prepare students with fundamental knowledge in programming languages, and tools and enable them to develop applications.

PEO 3: To develop professionally ethical individuals enhanced with analytical skills, communication skills and organizing ability to meet industry requirements.

PROGRAMME OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

A graduate of the Computer Science and Design Program will have an

PSO 1: Ability to understand, analyze and develop efficient software solutions using suitable algorithms, data structures, and other computing techniques.

PSO 2: Ability to independently investigate a problem which can be solved by a Human Computer Interaction (HCI) design process and then design an end-to-end solution to it (i.e., from user need identification to UI design to technical coding and evaluation). Ability to effectively use suitable tools and platforms, as well as enhance them, to develop applications/products using for new media design in areas like animation, gaming, virtual reality, etc.

PSO 3: Ability to apply knowledge in various domains to identify research gaps and to provide solution to new ideas, inculcate passion towards higher studies, creating innovative career paths to be an entrepreneur and evolve as an ethically social responsible computer science and design professional.

CURRICULUM

B. E. COMPUTER SCIENCE AND DESIGN Regulation 2019 | Total Credits: 168

SEMESTER I								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	HS19151	Technical English	HS	3	2	1	0	3
2.	MA19156	Linear Algebra and Calculus	BS	4	3	1	0	4
LAB ORIENTED THEORY COURSES								
3.	CD19141	Design Drawing and Visualization	BS	5	3	0	2	4
4.	GE19141	Programming using C	ES	6	2	0	4	4
5.	GE19122	Engineering Practices-Electrical and Electronics	ES	2	0	0	2	1
6.	PH19241	Physics for Information Science	BS	5	3	0	2	4
NON CREDIT COURSES								
7.	MC19102	Indian Constitution and Freedom Movement	MC	3	3	0	0	0
TOTAL				28	16	2	10	20

SEMESTER II								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	MA19255	Transforms and Partial Differential Equations	BS	4	3	1	0	4
2.	CD19201	Visual Design and Communication	ES	4	2	0	2	3
LAB ORIENTED THEORY COURSES								
3.	EE19242	Basic Electrical and Electronics Engineering	ES	5	3	0	2	4
4.	EC19243	Principles of Digital Electronics	ES	5	3	0	2	4
5.	CS19241	Data Structures	PC	7	3	0	4	5
LABORATORY COURSES								
6.	GE19121	Engineering Practices-Civil & Mechanical	ES	2	0	0	2	1
NON CREDIT COURSES								
7.	MC19101	Environmental Science and Engineering	MC	3	3	0	0	0
TOTAL				30	17	1	12	21

SEMESTER III								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	MA19154	Discrete Mathematics	BS	4	3	1	0	4
2.	GE19301	Life Science for Engineers	BS	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
3.	CD19341	Human Computer Interface	PC	5	3	0	2	4
4.	CD19342	Design Processes & Perspectives	PC	5	3	0	2	4
5.	CD19343	Computer Design	PC	5	3	0	2	4
6.	CS19342	Object Oriented Programming Paradigm	PC	7	3	0	4	5
NON CREDIT COURSES								
7.	MC19301	Essence of Indian Traditional Knowledge	MC	3	3	0	0	0
TOTAL				32	21	1	10	24

SEMESTER IV								
SI. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	MA19453	Probability and Statistics	BS	4	3	1	0	4
2.	CD19401	Strategic Design Management	HS	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
3.	CD19441	Design of Interactive systems	PC	4	2	0	2	3
4.	CS19441	Operating Systems	PC	7	3	0	4	5
5.	CS19341	Design and Analysis of Algorithms	PC	5	3	0	2	4
6.	CB19343	Software Engineering	PC	5	3	0	2	4
EMPLOYABILITY ENHANCEMENT COURSES								
7.	GE19421	Soft Skills – I	EEC	2	0	0	2	1
TOTAL				30	17	1	12	24

SEMESTER V								
Sl. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	CS19501	Theory of Computation	PC	3	3	0	0	3
2.		Professional Elective-I	PE	4	2	0	2	3
3.		Open Elective – I	OE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
4.	CS19541	Computer Networks	PC	7	3	0	4	5
5.	CS19443	Database Management Systems	PC	7	3	0	4	5
6.	CD19541	Animation & Graphics	PC	5	3	0	2	4
EMPLOYABILITY ENHANCEMENT COURSES								
7.	GE19521	Soft Skills – II	EEC	2	0	0	2	1
TOTAL				31	17	0	14	24

SEMESTER VI								
Sl. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.	CD19601	Fundamentals of Artificial Intelligence	PC	3	3	0	0	3
2.		Professional Elective-II	PE	4	2	0	2	3
LAB ORIENTED THEORY COURSES								
3.	CD19641	Game Design and Development	PC	5	3	0	2	4
4.	CD19642	Data Visualization using Python	PC	5	3	0	2	4
5.	CD19643	Web Essentials	PC	5	3	0	2	4
LABORATORY COURSES								
6.	CD19606	Mobile Application Design and Development Laboratory	PC	2	0	0	2	1
EMPLOYABILITY ENHANCEMENT COURSES								
7.	CD19651	Mini Project	EEC	4	0	0	4	2
8.	GE19621	Problem Solving Techniques	EEC	2	0	0	2	1
TOTAL				30	14	0	16	22

SEMESTER VII								
Sl. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Professional Elective-III	PE	4	2	0	2	3
2.		Professional Elective-IV	PE	4	2	0	2	3
3.		Professional Elective-V	PE	4	2	0	2	3
4.	CD19701	Fundamentals of Video for Engineers	PC	3	3	0	0	3
5.	CD19721	Introduction to 3D Animation	PC	1	1	0	0	1
LAB ORIENTED THEORY COURSES								
6.	CD19741	3D Printing and Design	PC	7	3	0	4	5
LABORATORY COURSES								
7.	CD19711	Project-I	EEC	6	0	0	6	3
TOTAL				29	13	0	16	21

SEMESTER VIII								
Sl. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
THEORY COURSES								
1.		Professional Elective-VI	PE	4	2	0	2	3
2.		Open Elective-II	OE	3	3	0	0	3
LABORATORY COURSES								
3.	CD19811	Project-II	EEC	12	0	0	12	6
TOTAL				19	5	0	14	12

TOTAL NO. OF CREDITS: 168

PROFESSIONAL ELECTIVES (PE)

Sl. NO.	COURSE CODE	COURSE TITLE	Category	Contact Periods	L	T	P	C
1	CD19P01	Python Programming	PE	4	2	0	2	3
2	CS19P09	C# and .Net Programming	PE	4	2	0	2	3
3	CD19P02	Computer Security	PE	4	2	0	2	3
4	CD19P03	Fundamentals of Image Processing	PE	4	2	0	2	3
5	CD19P04	Spatial Computing	PE	4	2	0	2	3
6	CD19P08	Mobile Computing Architecture	PE	4	2	0	2	3
7	CS19741	Cloud Computing	PE	4	2	0	2	3
8	AI19P77	Information Retrieval	PE	4	2	0	2	3
9	CD19P06	Innovation in Design Thinking	PE	4	2	0	2	3
10	CD19P07	Computer Vision and Image Analysis	PE	4	2	0	2	3
11	CS19P17	Foundations of Machine Learning	PE	4	2	0	2	3
12	AI19P61	GPU Programming	PE	4	2	0	2	3
13	CD19P09	Digital audio design and synthesis	PE	4	2	0	2	3
14	CD19P10	Aesthetics and Art	PE	4	2	0	2	3
15	CD19P11	Design for Usability	PE	4	2	0	2	3
16	AI19P62	AI Techniques in Data Mining	PE	4	2	0	2	3
17	CS19P20	Social, Text and Media Analytics	PE	4	2	0	2	3
18	CS19P19	Cognitive Science	PE	4	2	0	2	3
19	CD19P12	Foundations of Data Science	PE	4	2	0	2	3
20	CD19P21	Virtual Reality and Augmented Reality	PE	4	2	0	2	3
21	CD19P13	Quantum Computing Techniques	PE	4	2	0	2	3
22	AI19P82	Business Intelligence and Analytics	PE	4	2	0	2	3
23	CD19P14	Design for User Experience	PE	4	2	0	2	3
24	CD19P15	Wearable Applications	PE	4	2	0	2	3
25	CD19P16	Film Making and Radio Podcasting	PE	4	2	0	2	3
26	CD19P17	Visual Communication	PE	4	2	0	2	3
27	CD19P18	Introduction to Motion Graphics	PE	4	2	0	2	3

SUMMARY OF ALL COURSES

B. E. COMPUTER SCIENCE AND DESIGN										
S.NO	Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HS	3			3					06
2	BS	12	4	7	4					27
3	ES	5	12							17
4	PC		5	17	16	17	16	9		80
5	PE					3	3	9	3	18
6	OE					3			3	6
7	EEC				1	1	3	3	6	14
8	MC	0	0	0						0
	Total	20	21	24	24	24	22	21	12	168

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
HS19151	TECHNICAL ENGLISH	HS	2	1	0	3

Objectives:	
●	To enable learners to acquire basic proficiency in English reading and listening.
●	To write in English precisely and effectively.
●	To speak flawlessly in all kinds of communicative contexts.

UNIT-I	VOCABULARY BUILDING	9
The concept of word formation - Root words from foreign languages and their use in English - Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives - Synonyms, antonyms, and standard abbreviations. Compound words – abbreviation – single word substitution – Listening: Listening comprehension, listening to motivational speeches, podcasts and poetry. Speaking: Short talks on incidents - place of visit – admiring personalities, etc.		
UNIT-II	BASIC WRITING SKILLS	9
Sentence structures - Use of phrases and clauses in sentences - punctuation - coherence - Organizing principles of paragraphs in documents - Techniques for writing precisely. Reading & Writing – Free writing – paragraphs - article reading and writing criticism - change of tense forms in short text or story – inferential reading – rewrite or interpret text - prepare questions based on the text. Speaking: Everyday situations – conversations and dialogues, speaking for and against.		
UNIT-III	GRAMMAR AND LANGUAGE DEVELOPMENT	9
Subject-verb agreement- Noun-pronoun agreement - Articles – Prepositions – Redundancies. Reading & Writing: Read from innovation and ideas that changed the world, newspaper column writing – Speaking: Demonstrative speaking practice using visual aids (charts, graphs, maps, pictures, etc.)		
UNIT-IV	WRITING FOR FORMAL PRESENTATION	9
Nature and Style of sensible Writing - Describing – Defining – Classifying - Providing examples or evidence - Writing introduction and conclusion. Reading & Writing – Read from Literary pieces – identify different parts text – Difference between print and digital writing. Writing: Recommendations - Foreword - Review of book. Speaking- Formal Presentations – Debate on social issues/taboo and solutions.		
UNIT-V	EXTENDED WRITING AND SPEAKING	9
Writing: Précis writing – Essay writing – workplace communication: Resume – Business letters and emails – Proposals. Speaking: Panel discussion – reporting an event – mock interview – Master Ceremony.		
		Total Contact Hours : 45

Course Outcomes:	
On completion of the course students will be able to	
●	Discuss and respond to the listening content.
●	Read and comprehend different texts and appreciate them.
●	Understand structures and techniques of precise writing.
●	Analyze different genres of communication and get familiarized with new words, phrases, and sentence structures.
●	Write and speak appropriately in varied formal and informal contexts.

Text Book(s):	
1	English for Technologists & Engineers, Orient BlackSwan Publications, Chennai, 2012.

Reference Books(s):	
1	Meenakshi Raman & Sangeeta Sharma, Technical Communication, Oxford University Press.
2	Bushan Kumar, Effective Communication Skills, Khanna Publishing House, Delhi.
3	Pushplata, Sanjay Kumar, Communication Skills, Oxford University Press.
4	Michael Swan, Practical English Usage, Oxford University Press, 1995.
5	F.T. Wood, Remedial English Grammar, Macmillan, 2007.
6	William Zinsser, On Writing Well, Harper Resource Book, 2001.
7	Liz Hamp-Lyons and Ben Heasley, Study Writing, Cambridge University Press, 2006.
8	Exercises in Spoken English, Parts I-III, CIEFL, Hyderabad, Oxford University Press.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
HS19151.1	1	-	-	-	-	-	1	-	2	3	1	3	-	2	-
HS19151.2	-	3	-	2	-	-	-	-	-	2	1	1	2	-	-
HS19151.3	-	-	-	1	-	-	-	-	-	3	-	-	2	-	-
HS19151.4	-	1	-	1	-	-	-	-	-	3	-	2	3	-	1
HS19151.5	1	1	1	1	1	1	1	1	2	3	1	1	1	-	-
AVERAGE	1.0	1.7	1.0	1.3	1.0	1.0	1.0	1.0	2.0	2.8	1.0	1.8	2.0	2.0	1.0

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation : “-“

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MA19156	LINEAR ALGEBRA AND CALCULUS	BS	3	1	0	4

Objectives:	
●	To gain knowledge in using matrix algebra techniques and the concepts of basis and dimension in vector spaces.
●	To understand the techniques of calculus those are applied in the Engineering problems.

UNIT-I	MATRICES AND QUADRATIC FORMS	12
Symmetric and skew – symmetric matrices, Hermitian matrix, Unitary matrix and Orthogonal matrices – Eigen values and Eigen vectors - Cayley – Hamilton theorem (statement only) and applications - Similarity transformation - Orthogonal transformation and quadratic forms to canonical forms - Nature of quadratic forms.		
UNIT-II	VECTOR SPACES	12
Vector spaces – Subspaces – Linear combinations and system of Linear equations – Linear independence and Linear dependence – Bases and Dimensions – Linear Transformation – Matrix representation of Linear Transformation - Null space, Range and dimension theorem.		
UNIT-III	INNER PRODUCT SPACES	12
Inner product and norms - Gram Schmidt orthonormalization process - Modified Gram Schmidt orthonormalization process - QR Factorization-Singular value decomposition.		
UNIT-IV	DIFFERENTIAL CALCULUS- FUNCTIONS OF SEVERAL VARIABLES	12
Partial differentiation – Homogeneous functions and Euler’s theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables – Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.		
UNIT-V	MULTIPLE INTEGRAL	12
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.		
		Total Contact Hours : 60

Course Outcomes:	
On completion of the course students will be able to:	
●	Apply the concept of Eigen values and eigen vectors, diagonalization of a matrix for solving problems.
●	Use concepts of basis and dimension in vector spaces in solving problems.
●	Construct orthonormal basis using inner products and decompose matrices.
●	Analyze, sketch and study the properties of different curves and to handle functions of several variables and problems of maxima and minima.
●	Evaluate surface area and volume using multiple integrals.

Text Book(s):	
1	Grewal B.S., Higher Engineering Mathematics, 44th Edition, Khanna Publishers, New Delhi, 2015.
2	Gilbert Strang, Introduction to linear algebra, 6th Edition, Wellesley Publishers, 2016

Reference Books(s):	
1	Friedberg, A.H., Insel, A.J. and Spence, L., Elementary Linear Algebra, a matrix approach, 2 nd edition, Pearson, 2019.
2	Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley and Sons, 10th Edition, New Delhi, 2016.
3	Bali, N.P. and Manish Goyal, A Text Book of Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 2006.
4	T Veerarajan, Engineering Mathematics –I, McGraw Hill Education, 2018
5	Ramana. B.V., Higher Engineering Mathematics, McGraw Hill Education Pvt. Ltd, New Delhi, 2016.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA19156.1	3	3	2	2	2	1	-	-	-	-	1	2	2	3	2
MA19156.2	3	3	2	2	2	1	-	-	-	-	1	2	3	3	2
MA19156.3	3	3	2	2	2	1	-	-	-	-	1	2	3	3	2
MA19156.4	3	3	2	2	3	1	-	-	-	-	1	2	2	3	2
MA19156.5	3	3	1	2	1	1	-	-	-	-	1	2	1	2	2
Average	3	3	1.9	2	2	1	-	-	-	-	1	2	2.2	2.8	2

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name	Category	L	T	P	C
CD19141	DESIGN DRAWING AND VISUALIZATION	BS	3	0	2	4

Objectives:	
●	To enable drawing as a medium for observing, representing, conceptualizing, visualizing and communicating design ideas.
●	To develop an understanding of spatial concepts and the critical ability to think and visualize in three dimensions through the tactile nature of drawing.
●	To develop observational skills through the study of the environment and as a tool for visual representation, ideation/conceptualization, visualization and communication or presentation of design ideas through sketching and drawing from both observation and memory.

UNIT-I	INTRODUCTION TO DESIGN DRAWING	9
Introduction to Materials, Tools & Methods - different grades of pencils & exploring- Developing free finger, wrist, hand & arm movement and initiate muscle- Introduction to Observation – Scrutinize, Examine, Study, Inspect, Perceive, Sense, Feel, Notice, Identify, Understand- Training the eye to observe accurately to educate the visual sense- Introduction to Perception – View, Opinion, Insight, Discernment- Introduction to Perspective – Eye level, Vanishing Point		
UNIT-II	DRAWING OF CUBES and PERSPECTIVES	9
Introduction to Vanishing Points, View Point, Eye Level, Horizon, Parallel & Converging Lines-One Point Perspective- Two Point Perspective-Three Point Perspective-Perspective in the Environment, Interior Spaces and Objects.		
UNIT-III	OBJECT DRAWING and HUMAN FORM DRAWING	9
Introduction to other geometric forms like cylinder, cuboids etc.- Introduction to Object Drawing-How to observe – shape, proportions, effect of light on the objects etc.- Introduction to Human Form proportions-Human Form – Object Relationships		
UNIT-IV	GEOMETRY & STRUCTURE	9
Construction of Basic Polygons-Proportioning Systems: Golden Proportion- Interrelation of Polygons- Orthographic Projection of Planes and Solids-. Isometric Projection-Architectonic Drawing - Isometric Circles-Architectonic Planes with rounded surfaces, tube with square cross section with ellipse at different planes and tube with circular cross-section.		
UNIT-V	VISUALISATION DRAWING	9
Introduction to Mental Imagery- Compositions inclusive of human forms, object, perspective etc- Sketching a mini environment outside the campus from memory- Sketching a visualised composition from imagination		
Total Contact Hours		: 45

Course Outcomes:	
On completion of the course students will be able to	
●	Develop the skill & ability to observe and visually represent all the elements in their environment with a focus on human forms, objects and nature and the way they interact.
●	inculcate skills and develop the ability to explain the importance of precision in design through drawings using instruments/tools and concept of figures/configuration through basic geometrical patterns on 2D surfaces..
●	Develop the ability to discuss orthographic and isometric projections as fundamental tools of technical drawing and use technical drawings as a tool for visual communication.
●	Develop the ability to analyse visual structure of 3D forms on 2D surfaces with an exposure to the complexities of imagination and visualization.
●	Develop the ability to analyse complex images and in turn develop the ability to create mental imageries and visualise concepts.

Text Book(s):	
	1. Erik Olofsson, Klara Sjolen, Design Sketching, KEEOS Design Books. 2. K . Morling, Geometric and Engineering Drawing, Third Edition, Graduate of the Institution of Mechanical Engineers, SI Units, Elsevier, 2010.

Reference Books(s):	
1	Flint, Tom, Anatomy for the Artist: The Dynamic of the Human Form, London, Arcturus Publishing.
2	Koos Eissen, Roselien Steur, Sketching: The Basics, BIS Publishers

3	Edwards, Betty, Drawing on the Artist Within : An Inspirational and Practical Guide to Increasing Your Creative Powers, Simon & Schuster Inc., New York
4	Michael Swan, Practical English Usage, Oxford University Press, 1995.
5	F.T. Wood, Remedial English Grammar, Macmillan, 2007.
6	William Zinsser, On Writing Well, Harper Resource Book, 2001.
7	Liz Hamp-Lyons and Ben Heasley, Study Writing, Cambridge University Press, 2006.
8	Exercises in Spoken English, Parts I-III, CIEFL, Hyderabad, Oxford University Press.

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
PH19241	PHYSICS FOR INFORMATION SCIENCE	BS	3	0	2	4

Objectives:						
●	To understand the principles of laser and fibre optics in engineering and technology.					
●	To understand the advanced concept of quantum theory and applications.					
●	To study the properties and applications of semiconducting, magnetic, superconducting and optical materials.					

UNIT-I	QUANTUM PHYSICS	9
Introduction- Quantum free electron theory-De Broglie's concept-Schrodinger wave equation-Time independent and time dependent equations-Physical significance of wave function - Particle in a one dimensional box – electrons in metals - degenerate states – Fermi - Dirac statistics – Density of energy states – Size dependence of Fermi energy – Quantum confinement – Quantum structures – Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials.		
UNIT-II	SEMICONDUCTOR PHYSICS	9
Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap - semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type and P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect.		
UNIT-III	OPTICAL PROPERTIES OF MATERIALS	9
Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – Photo transistor-solar cell - LED – Organic LED- Optical data storage techniques-Non Linear Optical materials-properties and applications.		
UNIT-IV	LASERS AND FIBRE OPTICS	9
Lasers: Population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) - Semiconductor lasers: homojunction and heterojunction- Applications. Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibers (material, refractive index, and mode) –Double crucible method-splicing technique- losses associated with optical fibers -Fiber optic communication system - fiber optic sensors: pressure and displacement.		
UNIT-V	MAGNETIC AND SUPERCONDUCTING MATERIALS	9
Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility -Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses– Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor). Introduction of Superconductivity, Properties of Superconductors, BCS theory (Qualitative), Type-I and Type II Superconductors -Magnetic Levitation-SQUIDS- An overview of High temperature superconductors.		
Contact Hours		: 45

List of Experiments (Any 10 experiments)			
1	Determine the wavelength and angle of divergence of laser beam and numerical aperture using fiber cable.		
2	Determine the wavelength of spectrum by using spectrometer.		
3	Determine of refractive index of a given prism by using spectrometer.		
4	Determine specific resistance of the material of given wires using metre bridge.		
5	Verify Ohm's law - series and parallel.		
6	Determine the value of Planck's constant using photo electric effect.		
7	Determine the band gap of given semiconductor.		
8	Determination of Hall coefficient of semiconducting materials.		
9	Study the magnetic field produced by current carrying coils by using Helmholtz coil.		
10	Study the resonance frequency in series connected LCR circuits.		
11	Determine the wavelength of given source by using Newton's ring Experiment.		
12	Determine the thickness of the given specimen by using air wedge method.		
Contact Hours		:	30
Total Contact Hours		:	75

Course Outcomes:	
On completion of the course, the students will be able to:	
●	Apply the concepts of electron transport in nanodevices.
●	Analyze the physics of semiconductor devices
●	Analyze the properties of optical materials for optoelectronic applications.
●	Use the concepts of Laser and Fiber optics in communication.
●	Use the properties of magnetic and superconducting materials in data storage devices.

Text Book(s):	
1	Bhattacharya, D.K. & Poonam, T. Engineering Physics, Oxford University Press, 2015.
2	Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
3	Kasap, S.O. Principles of Electronic Materials and Devices, McGraw-Hill Education, 2007.
4	Kittel, C. Introduction to Solid State Physics, Wiley, 2005.

Reference Books(s):	
1	Garcia, N. & Damask, A., Physics for Computer Science Students, Springer Verlag, 2012.
2	Hanson, G.W. Fundamentals of Nanoelectronics, Pearson Education, 2009.
3	Rogers, B., Adams, J. & Pennathur, S. Nanotechnology: Understanding Small Systems, CRC Press, 2014.
4	S. O. Pillai, Solid state physics, New Age International, 2015.
5	Serway, R.A. & Jewett, J.W, Physics for Scientists and Engineers, Cengage Learning.

CO - PO – PSO matrices of course

PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO															
PH19241.1	3	3	2	2	2	1	-	1	1	2	1	2	1	1	2
PH19241 .2	3	3	3	2	3	1	1	-	1	2	1	2	1	1	2
PH19241 .3	3	3	3	2	3	1	1	-	1	2	1	2	1	1	1
PH19241 .4	3	3	2	2	3	1	1	-	1	2	1	2	1	-	1
PH19241 .5	3	3	2	2	3	1	1	-	1	2	1	2	1	1	1
Average	3.0	3.0	2.4	2.0	2.8	1.0	1.0	1.0	1.0	2.0	1.0	2.0	1.0	1.0	1.4

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
GE19141	PROGRAMMING USING C	ES	2	0	4	4

Objectives:	
●	To develop simple algorithms for arithmetic and logical problems.
●	To develop C Programs using basic programming constructs
●	To develop C programs using arrays and strings
●	To develop applications in C using functions, pointers and structures
●	To do input/output and file handling in C

UNIT-I	GENERAL PROBLEM SOLVING CONCEPTS	6
Computer – components of a computer system-Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.		
UNIT-II	C LANGUAGE - TYPES OF OPERATOR AND EXPRESSIONS	6
Introduction- C Structure- syntax and constructs of ANSI C - Variable Names, Data Type and Sizes, Constants, Declarations - Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, proper variable naming and Hungarian Notation.		
UNIT-III	I/O AND CONTROL FLOW	6
Standard I/O, Formatted Output – Printf, Variable-length argument lists- Formatted Input – Scanf, Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, GoTo Labels.		
UNIT-IV	FUNCTIONS AND PROGRAM STRUCTURE	6
Basics of functions, parameter passing and returning type, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, C Pre-processor, Standard Library Functions and return types.		
UNIT-V	POINTERS, ARRAYS AND STRUCTURES	6
Pointers and addresses, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional arrays, Strings, Initialisation of Pointer Arrays, Command line arguments, Pointers to functions, complicated declarations. Basic Structures, Structures and Functions, Array of structures, Pointer of Structures, Self-referential Structures, Table look up, Typedef, Unions, Bit-fields, File Access -Error Handling, Line I/O, Miscellaneous Functions.		
		Contact Hours
		: 30

List of Experiments		Contact Hours	:	60
1	Algorithm and flowcharts of small problems like GCD.			
	Structured code writing with:			
2	Small but tricky codes			
3	Proper parameter passing			
4	Command line Arguments			
5	Variable parameter			
6	Pointer to functions			
7	User defined header			
8	Make file utility			
9	Multi file program and user defined libraries			
10	Interesting substring matching / searching programs			
11	Parsing related assignments			
		Contact Hours	:	60
		Total Contact Hours	:	90

Course Outcomes:	
On completion of the course, the students will be able to	
●	Formulate simple algorithms for arithmetic and logical problems.
●	Implement conditional branching, iteration and recursion.
●	Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
●	Use arrays, pointers and structures to formulate algorithms and programs.
●	Apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

Text Books:

1	Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Pearson Education India; 2 nd Edition, 2015.
2	Byron Gottfried, Programming with C, Second Edition, Schaum Outline Series, 1996.

Reference Books:

1	Herbert Schildt, C: The Complete Reference, Fourth Edition, McGraw Hill, 2017.
2	Yashavant Kanetkar, Let Us C, BPB Publications, 15 th Edition, 2016.

Web links for virtual lab:

1	https://www.tutorialspoint.com/compile_c_online.php
2	https://www.codechef.com/ide
3	https://www.jdoodle.com/c-online-compiler
4	https://rextester.com/l/c_online_compiler_gcc

CO - PO – PSO matrices of course

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
GE19141.1	1	2	2	2	1	-	-	-	1	2	1	1	2	3	-	
GE19141.2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	-	
GE19141.3	1	1	2	1	1	-	-	-	-	-	1	1	2	2	-	
GE19141.4	2	2	3	2	1	-	-	-	1	-	2	1	2	2	2	
GE19141.5	2	2	3	2	1	-	-	-	-	-	2	1	2	2	2	
Average	1.4	1.6	2.2	1.6	1.0	-	-	-	1.0	2.0	1.4	1.0	2.0	2.2	2.0	

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
GE19122	ENGINEERING PRACTICES - ELECTRICAL AND ELECTRONICS	ES	0	0	2	1

Objectives:

- To provide hands on experience on various basic engineering practices in Electrical Engineering.
- To impart hands on experience on various basic engineering practices in Electronics Engineering.

List of Experiments

A. ELECTRICAL ENGINEERING PRACTICE

- 1 Residential house wiring using switches, fuse, indicator, lamp and energy meter.
- 2 Fluorescent lamp wiring.
- 3 Stair case wiring.
- 4 Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
- 5 Measurement of resistance to earth of electrical equipment.

B. ELECTRONICS ENGINEERING PRACTICE

- 1 Study of Electronic components and equipment's – Resistor, colour coding, measurement of AC signal parameter (peak-peak, RMS period, frequency) using CRO.
- 2 Study of logic gates AND, OR, XOR and NOT.
- 3 Generation of Clock Signal.
- 4 Soldering practice – Components Devices and Circuits – Using general purpose PCB.
- 5 Measurement of ripple factor of HWR and FWR.

Total Contact Hours : 30

Course Outcomes:

On completion of the course, the students will be able to

- Fabricate electrical and electronic circuits
- Formulate the house wiring
- Design the AC-DC converter using diode and passive components

REFERENCE

- 1 Bawa H.S., Workshop Practice, Tata McGraw – Hill Publishing Company Limited, 2007.
- 2 Jeyachandran K., Natarajan S. & Balasubramanian S., A Primer on Engineering Practices Laboratory, Anuradha Publications, 2007.
- 3 Jeyapooan T., Saravanapandian M. & Pranitha S., Engineering Practices Lab Manual, Vikas Publishing House Pvt.Ltd, 2006.
- 4 Rajendra Prasad A. & Sarma P.M.M.S., Workshop Practice, SreeSai Publication, 2002.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GE19122.1	3	3	3	3	3	1	1	-	2	1	3	3	-	-	-
GE19122.2	3	3	3	3	2	2	2	-	2	1	3	3	-	-	-
GE19122.3	3	3	3	3	3	1	1	-	2	1	3	3	-	-	-
Average	3	3	3	3	2.67	1.33	1.33	-	2	1	3	3	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MC19102	INDIAN CONSTITUTION AND FREEDOM MOVEMENT	MC	3	0	0	0

Objectives:	
•	To inculcate the values enshrined in the Indian constitution
•	To create a sense of responsible and active citizenship
•	To know about Constitutional and Non- Constitutional bodies
•	To understand sacrifices made by the freedom fighters

UNIT-I	INTRODUCTION	9
Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens. Constitution meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.		
UNIT-II	STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT	9
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.		
UNIT-III	STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCALBODY	9
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts- Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Panchayat Raj: Introduction, Elected officials and their roles, ,Village level: Role of Elected and Appointed officials,		
UNIT-IV	CONSTITUTIONAL FUNCTIONS AND BODIES	9
Indian Federal System – Center – State Relations – President’s Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.		
UNIT-V	INDIAN FREEDOM MOVEMENT	9
British Colonialism in India-Colonial administration till 1857- Revolt of 1857- Early Resistance to British Rule-Rise of Nationalism in India-Indian Freedom Struggle under Mahatma Gandhi-Non- Cooperation Movement-Civil Disobedience Movement- Quit India Movement-British Official response to National movement- Independence of India Act 1947-Freedom and Partition.		
		Total Contact Hours : 45

Course Outcomes:	
On completion of the course, the students will be able to	
•	Understand the functions of the Indian government
•	Understand and abide the rules of the Indian constitution.
•	Gain knowledge on functions of state Government and Local bodies
•	Gain Knowledge on constitution functions and role of constitutional bodies and non-constitutional bodies
•	Understand the sacrifices made by freedom fighters during freedom movement

Text Book(s):	
1	Durga Das Basu, Introduction to the Constitution of India, Lexis Nexis, New Delhi., 21st edition, 2013.
2	BipanChandra,History of Modern India, Orient Black Swan, 2009.
3	Bipan Chandra, India's Struggle for Independence, Penguin Books, 2016.
4	Maciver and Page, Society: An Introduction Analysis, MacMilan India Ltd., New Delhi.2nd edition, 2014.
5	P K Agarwal and K N Chaturvedi, PrabhatPrakashan Constitution of India, New Delhi, 1st edition, 2017.

Reference Books(s) / Web links:	
1	Sharma, Brij Kishore, Introduction to the Constitution of India, Prentice Hall of India, New Delhi.
2	U.R.Gahai, Indian Political System, New Academic Publishing House, Jalandhar.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MC19102.1	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19102.2	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19102.3	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19102.4	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
MC19102.5	-	-	-	-	-	1	1	3	2	-	-	1	-	-	-
Average	-	-	-	-	-	1.0	1.0	3.0	2.0	-	-	1.0	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MA19255	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	BS	3	1	0	4

Objectives:

●	To introduce the effective mathematical tools for solving partial differential equations that model several physical processes.
●	To introduce Fourier series which is central to many applications in engineering apart from its use in solving boundary value problems.
●	To learn the techniques of solving problems using Laplace transforms.
●	To acquaint the student with Fourier transform techniques used in wide variety of situations.
●	To introduce Z transform techniques to solve problems involving discrete time systems.

UNIT-I	PARTIAL DIFFERENTIAL EQUATIONS	12
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order PDE: $f(p, q) = 0$, $f(z, p, q) = 0$, $z = px + qy + f(p, q)$, $f(x, p) = f(y, q)$ - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of homogeneous type.		
UNIT-II	FOURIER SERIES	12
Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Harmonic analysis.		
UNIT-III	LAPLACE TRANSFORM	12
Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Transforms of unit step function and impulse functions, periodic functions. Inverse Laplace transform – Problems using Convolution theorem – Initial and final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.		
UNIT-IV	FOURIER TRANSFORMS	12
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity - Application to boundary value problems.		
UNIT-V	Z - TRANSFORMS AND DIFFERENCE EQUATIONS	12
Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z- transform.		
		Total Contact Hours : 60

Course Outcomes:

On completion of course students will be able to

●	solve different types of partial differential equations.
●	construct Fourier series for different periodic functions and to evaluate infinite series.
●	use Laplace transform and inverse transform techniques in solving differential equations.
●	solve Engineering problems using Fourier transform techniques.
●	solve difference equations using Z – transforms that arise in discrete time systems.

Text Book (s):

1	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2	Veerarajan. T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt.Ltd., New Delhi, Second reprint, 2012.

Reference Books(s):	
1	Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi, 2014.
2	Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3	Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4	Ray Wylie C and Barrett.L.C, "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
5	Datta K.B., "Mathematical Methods of Science and Engineering", Cengage Learning IndiaPvt. Ltd, Delhi, 2013.

Subject Code	Subject Name	Category	L	T	P	C
CD19201	VISUAL DESIGN AND COMMUNICATION	ES	2	0	2	3

Objectives:						
●	To understand the principles of the visual language and their semantic use. A multi-disciplinary domain, design consists of, aesthetics, architecture, products, communication, processes, systems, technology, business/commerce, ramification on environment and society and demands					
●	To communicate more concisely and in a visually appropriate manner, it is necessary to use commonly understood principles, perspective and design layout standards.					
●	To understand the fundamentals of Typography and Photography.					

UNIT-I	INTRODUCTION TO VISUAL DESIGN	9
importance of understanding visual language-its relation in context to nature and environment-Exploring and understanding Dots, Lines, Forms, Space, Pattern, Texture and Colour as an elements of visual language		
UNIT-II	INTRODUCTION TO THE PRINCIPLES OF VISUAL LANGUAGE	9
Visual explorations and experiments with Form, Colour, and Space, Texture, in relation to the context and environments – Concepts of harmony, balance, contrast, proportion, order, symmetry, asymmetry, rhythm, tension, juxtaposition, proximity, size, scale, proportion, orientation, alignment, variety, gradation, dominance, subordination, transition etc.		
UNIT-III	. INTRODUCTION TO FUNDAMENTALS OF TYPOGRAPHY	9
Introduction to Type and its History-Type as a form and means of communication in our environment-Introduction to Indian type: Vernacular letter-forms-Classification of types: Typefaces, type families and type designers-Anatomy of the type: x-height, ascenders, descenders, counter, cap-height, baseline, etc-Typographic variables: Kerning, tracking, leading, spacing etc.-Semantics of type: Legibility & readability issues in type and meaning attributed to type. 4h. Expressive Typography-Introduction to printing techniques		
UNIT-IV	INTRODUCTION TO PHOTOGRAPHY	9
Introduction and Orientation: Art and Science of Photography. Drawing out parallels / differences between the EYE and the CAMERA-Camera: Understanding the various controls on a Digital SLR Camera Features and Details. Shooting Modes. Aperture and Depth of Field. Shutter Speed. Critical Shutter Speeds and Effects- Exposure: Exposure as function of Quantity of Light and Time. Getting used to shooting in Manual Mode and learning to measure light using the camera's built-in exposure meter-Film Speed/Sensor Sensitivity: Understanding the role of sensitivity in Exposure. ISO/ASA and Digital Noise-Lenses: Different Types of Lenses. Classification of Lenses by Focal Lengths. Angle of View. Fixed Focal Length and Zoom Lenses. Close up and Macro Lenses-Light and Color Temperature- Digital Post-Production: Introduction to File-Formats. RAW vs.JPG. Understanding resolution, resizing and basic image post processing using Photoshop. Exploring the software to visualize and create digital mosaics.		
UNIT-V	INTRODUCTION TO VIDEOGRAPY	9
Concept development 8b. Storyboarding-Video Shooting - Framing, Camera movement etc 8d. Video Editing-Defining communication-Sender, Channel and Receiver-Semiotics - Study of sign process (semiosis), meaning-making and meaningful communication. 9c. Sign, Signifier, Signified-Denotation and Connotation-10a. Story, narrative and see different perspectives-Identifying problems, opportunities and improvements. 10c. Differentiating problem, need and conflict-Persona study-Scenario study		
		Total Contact Hours : 45
Course Outcomes:		
On completion of the course students will be able to		
●	Develop the ability to create visual compositions using basic elements and by applying appropriate principles of visual composition to communicate	
●	Develop the ability to perceive, visualize, and communicate visual elements as visual narratives.	
●	Develop the ability to apply the dynamics of visual design in Typography and Photography.	
●	Develop the ability to address simple communication problems through a visualization process and construct mental imageries	
●	Demonstrate the ability to plan, develop, design and execute communication products	

Text Book(s):	
	Wallschlaeger, Charles, & Busic-Synder, Cynthia, Basic Visual Concepts and Principles for Artists, Architects and Designers, McGraw-Hill, (1992).

Reference Books(s):	
9	Buxton, Bill, Sketching User Experience: Getting the Design Right and the Right Design (Interactive Technologies), Morgan Kaufmann, (2007).
10	Caplin, Steve; Banks, Adam, The Complete Guide to Digital Illustration, Publisher: Watson - Guptill Publications, (2003).

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
EE19242	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	ES	3	0	2	4

Objectives:	
●	To introduce electric circuits and provide knowledge on the analysis of circuits using network theorems.
●	To impart knowledge on the phenomenon of resonance in RC, RL and RLC series and parallel circuits.
●	To provide knowledge on the principles of electrical machines and electronic devices.
●	To learn the concepts of different types of electrical measuring instruments and transducers.
●	To teach methods of experimentally analyzing electrical circuits, electrical machines, electronic devices and transducers.

UNIT-I	DC CIRCUITS	9
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.		
UNIT-II	AC CIRCUITS	9
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections		
UNIT-III	ELECTRICAL MACHINES	9
Construction, Principles of operation and characteristics of; DC machines, Transformers (single and three phase), Synchronous machines, three phase and single-phase induction motors.		
UNIT-IV	ELECTRONIC DEVICES & CIRCUITS	9
Types of Materials – Silicon & Germanium- N type and P type materials – PN Junction –Forward and Reverse Bias – Semiconductor Diodes –Bipolar Junction Transistor – Characteristics –Field Effect Transistors – Transistor Biasing – Introduction to operational Amplifier –Inverting Amplifier –Non Inverting Amplifier.		
UNIT-V	MEASUREMENTS & INSTRUMENTATION	9
Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect - Classification of instruments - PMMC and MI Ammeters and Voltmeters – Multimeter -Digital Storage Oscilloscope.		
		Contact Hours : 45

List of Experiments		
1	Verification of Kirchoff's Laws.	
2	Load test on DC Shunt Motor.	
3	Load test on Single phase Transformer.	
4	Load test on Single phase Induction motor.	
5	Characteristics of P-N junction Diode.	
6	Half wave and Full wave Rectifiers.	
7	Characteristics of CE based NPN Transistor.	
8	Inverting and Non- Inverting Op-Amp circuits.	
9	Characteristics of LVDT, RTD and Thermistor.	
		Contact Hours : 30
		Total Contact Hours : 75

Course Outcomes:	
On completion of the course, the students will be able to	
●	Analyse DC and AC circuits and apply circuit theorems.
●	Realize series and parallel resonant circuits.
●	Understand the principles of electrical machines.
●	Understand the principles of different types of electronic devices, electrical measuring instruments and transducers.
●	Experimentally analyze the electric circuits, electrical machines, electronic devices, and transducers.

Text Book(s):

1	J.B.Gupta, Fundamentals of Electrical Engineering and Electronics, S.K.Kataria & Sons Publications, 2002.
2	D P Kothari and I.J Nagarath, Basic Electrical and Electronics Engineering, McGraw Hill Education (India) Private Limited, Third Reprint, 2016
3	Thereja .B.L., Fundamentals of Electrical Engineering and Electronics, S. Chand & Co. Ltd., 2008

Reference Books(s):

1	Del Toro, Electrical Engineering Fundamentals, Pearson Education, New Delhi, 2007
2	John Bird, Electrical Circuit Theory and Technology, Elsevier, First Indian Edition, 2006
3	Allan S Moris, Measurement and Instrumentation Principles, Elsevier, First Indian Edition, 2006
4	Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall of India, 2006
5	A.E.Fitzgerald, David E Higginbotham and Arvin Gabel, Basic Electrical Engineering, McGraw Hill Education (India) Private Limited, 2009

CO - PO – PSO matrices of course

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
EE19242.1	2	2	2	3	3	2	1	-	-	-	-	3	2	2	2
EE19242.2	1	2	2	3	2	2	3	-	-	-	-	-	1	-	1
EE19242.3	2	3	2	1	2	2	2	-	2	-	-	1	2	2	2
EE19242.4	3	3	2	3	1	2	2	-	-	-	2	2	2	1	2
EE19242.5	3	3	2	2	2	1	2	1	2	1	2	1	2	3	2
Average	2.2	2.6	2.0	2.4	2.0	1.8	2.0	1.0	2.0	1.0	2.0	1.8	1.8	2.0	1.8

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
EC19243	PRINCIPLES OF DIGITAL ELECTRONICS	ES	3	0	2	4

Objectives:	
●	To learn the basic postulates of Boolean algebra and infer the methods for simplifying Boolean expressions
●	To understand the design of various Combinational circuits.
●	To extrapolate the design of Synchronous Sequential circuits using Flip-Flops.
●	To know the design procedure of Asynchronous Sequential circuits and its problems.
●	To understand the concept of Programmable Logic Devices for the design of digital circuits and Familiar with Verilog HDL.

UNIT-I	BOOLEAN ALGEBRA AND LOGIC GATES	9
Fundamentals: Boolean postulates and laws, De-Morgan's Theorem, Principle of Duality, Boolean expression, Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS). Minimization Techniques: Minimization of Boolean expressions using Boolean Laws, Karnaugh map, Quine McCluskey method of minimization, don't care conditions. Logic Gates: NAND– NOR implementations.		
UNIT-II	COMBINATIONAL CIRCUITS	9
Half adder, Full Adder, Half subtractor, Full subtractor, Carry Look Ahead adder, Parallel Binary Adder/Subtractor, BCD adder, Binary Multiplier, Parity generator, Parity checker, Magnitude Comparator, Encoder, Decoder, Multiplexer-Logic function implementation, Demultiplexer. Code converter- Binary to Gray and Gray to Binary		
UNIT-III	SYNCHRONOUS SEQUENTIAL CIRCUITS	9
Memory elements: Latches, Flip-flops: RS, JK, D, T, Master-Slave, Triggering of Flip Flops, Realization of one flip flop using other flip flop. Design: Synchronous and Asynchronous counters - Up/Down counter, Modulo–N counter. Shift Registers - SISO, SIPO, PISO, PIPO, Universal Shift Registers. Shift Register Counters - Ring counter, Shift counter. Design of synchronous sequential circuits using Moore and Mealy model		
UNIT-IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	9
Design and analysis of asynchronous sequential circuits using Fundamental and pulse mode, Problems in Asynchronous sequential Circuits- Races, Cycles and Hazards.		
UNIT-V	PROGRAMMABLE LOGIC DEVICES	9
Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field Programmable Gate Arrays (FPGA), Implementation of Combinational Logic Circuits using PROM, PLA, PAL. Implementation of basic combinational circuits using Verilog HDL.		
		Contact Hours : 45

List of Experiments			
1	Implementation of Binary to Gray and Gray to Binary code converters		
2	Logic function implementation of Multiplexer and De-multiplexer using logic gates.		
3	Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- Flop.		
4	Design and Implementation of 4-bit Asynchronous and BCD Synchronous counters.		
5	Implementation of Adder and Subtractor using Verilog HDL.		
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS			
❖ IC Trainer Kit – 15 Nos			
❖ Bread Boards – 15 Nos			
❖ ICs each 50 Nos – 7400,7402, 7404, 7486, 7408, 7432, 7411, 74151, 74150, 7474, 7476			
❖ System with HDL			
		Contact Hours	: 30
		Total Contact Hours	: 75

Course Outcomes:	
On completion of the course, the students will be able to	
●	Simplify the Boolean expressions using basic postulates of Boolean algebra with suitable minimization techniques.
●	Design and Implement Combinational circuits.
●	Construct Synchronous Sequential circuits using Flip-Flops.

- Design Asynchronous Sequential circuits and analyse its problems.
- Implement digital circuits using Programmable Logic Devices and Familiar with Verilog HDL.

Text Books:

1	Morris Mano & Michael D Ciletti, “Digital Design: With an Introduction to Verilog HDL, 5th Edition, Pearson Education ,2013.
2	Charles H.Roth. “Fundamentals of Logic Design”, 7th Edition, Thomson Learning, 2014.

Reference Books:

1	John F.Wakerly, “Digital Design”, Fourth Edition, Pearson/PHI, 2008
2	John.M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2006.
3	Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 6th Edition, TMH, 2006.
4	Thomas L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson Education Inc, 2011.
5	Donald D.Givone, “Digital Principles and Design”, TMH, 2003.

Web links for virtual lab:

1	http://vlabs.iitkgp.ernet.in/dec/#
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CO - PO – PSO matrices of course

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
EC19243.1	2	2	1	2	2	-	-	-	-	-	-	1	1	2	-
EC19243.2	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
EC19243.3	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
EC19243.4	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
EC19243.5	1	1	2	1	1	-	-	-	-	-	-	1	1	2	-
Average	1.2	1.2	1.8	1.2	1.2	-	-	-	-	-	-	1.6	1.6	2.0	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
CS19241	DATA STRUCTURES	PC	3	0	4	5

Objectives:

●	To apply the concepts of List ADT in the applications of various linear and nonlinear data structures.
●	To demonstrate the understanding of stacks, queues and their applications.
●	To analyze the concepts of tree data structure.
●	To understand the implementation of graphs and their applications.
●	To be able to incorporate various searching and sorting techniques in real time scenarios.

UNIT-I	LINEAR DATA STRUCTURES – LIST	9
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).		
UNIT-II	LINEAR DATA STRUCTURES – STACKS, QUEUES	9
Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue –DEQUE –applications of queues.		
UNIT-III	NON LINEAR DATA STRUCTURES – TREES	9
Tree Terminologies- Binary Tree–Representation-Tree traversals – Expression trees – Binary Search Tree–AVL Trees –Splay Trees - Binary Heap – Applications.		
UNIT-IV	NON LINEAR DATA STRUCTURES – GRAPHS	9
Graph Terminologies – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort - Shortest path - Dijkstra's Algorithm - Minimum Spanning Tree- Prim's Algorithm.		
UNIT-V	SEARCHING, SORTING AND HASHING TECHNIQUES	9
Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort – Shell sort – Quick sort - Merge Sort. Hashing- Hash Functions –Collision resolution strategies- Separate Chaining – Open Addressing – Rehashing.		
		Contact Hours : 45

List of Experiments

1	Array implementation of Stack and Queue ADTs	
2	Array implementation of List ADT	
3	Linked list implementation of List, Stack and Queue ADTs	
4	Applications of List, Stack and Queue ADTs	
5	Implementation of Binary Trees and operations of Binary Trees	
6	Implementation of Binary Search Trees	
7	Implementation of AVL Trees	
8	Implementation of Heaps using Priority Queues	
9	Graph representation and Traversal algorithms	
10	Applications of Graphs	
11	Implementation of searching and sorting algorithms	
12	Hashing –any two collision techniques	
		Contact Hours : 60
		Total Contact Hours : 105

Course Outcomes:

On completion of the course, the students will be able to

●	Analyze the various data structure concepts.
●	Implement Stacks and Queue concepts for solving real-world problems.
●	Analyze and structure the linear data structure using tree concepts.

●	Critically Analyse various non-linear data structures algorithms.
●	Apply different Sorting, Searching and Hashing algorithms.

Text Books:

1	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2002.
2	ReemaThareja, Data Structures Using C, Second Edition, Oxford University Press, 2014.

Reference Books:

1	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest and Clifford Stein, Introduction to Algorithms, Second Edition, McGraw Hill, 2002.
2	Aho, Hopcroft and Ullman, Data Structures and Algorithms, Pearson Education, 1983.
3	Stephen G. Kochan, Programming in C, 3rd edition, Pearson Education.
4	Ellis Horowitz, SartajSahni and Susan Anderson Freed, Fundamentals of Data Structures in C, 2 nd Edition, University Press, 2008.

Web links for virtual lab (if any)

1	http://vlabs.iitb.ac.in/vlab/labscse.html
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CO - PO – PSO matrices of course

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CS19241.1	1	2	1	2	1	-	-	-	-	-	-	1	1	2	-
CS19241.2	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.3	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.4	1	1	2	1	1	-	-	-	-	-	-	2	2	2	-
CS19241.5	1	1	2	1	1	-	-	-	-	-	-	1	1	2	-
Average	1.0	1.2	1.8	1.2	1.0	-	-	-	-	-	-	1.6	1.6	2.0	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name (Laboratory Course)	Category	L	T	P	C
GE19121	ENGINEERING PRACTICES – CIVIL& MECHANICAL	ES	0	0	2	1

Objectives:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

List of Experiments

List of Experiments							
CIVIL ENGINEERING PRACTICE							
1.	Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.						
2.	Preparation of basic plumbing line sketches for wash basins, water heaters, etc.						
3.	Hands-on-exercise: Basic pipe connections –Pipe connections with different joining components.						
Carpentry Works:							
4.	Study of joints in roofs, doors, windows and furniture.						
5.	Hands-on-exercise: Woodwork, joints by sawing, planning and chiseling.						
MECHANICAL ENGINEERING PRACTICE							
6.	Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.						
7.	Gas welding practice.						
Basic Machining:							
8.	Simple Turning and Taper turning						
9.	Drilling Practice						
Sheet Metal Work:							
10.	Forming & Bending:						
11.	Model making – Trays and funnels						
12.	Different type of joints.						
Machine Assembly Practice:							
13.	Study of centrifugal pump						
14.	Study of air conditioner						
					Total Contact Hours	:	30

Course Outcomes:

On completion of the course, the students will be able to

- Perform plumbing activities for residential and industrial buildings considering safety aspects while gaining clear understanding on pipeline location and functions of joints like valves, taps, couplings, unions, reducers, elbows, etc.
- Perform wood working carpentry activities like sawing, planning, cutting, etc. while having clear understanding of the joints in roofs, doors, windows and furniture.
- Produce joints like L joint, T joint, Lap joint, Butt joint, etc. through arc welding process while acquiring in depth knowledge in the principle of operation of welding and other accessories
- Perform operations like Turning, Step turning, Taper turning, etc. in lathe and Drilling operation in drilling machine
- Perform sheet metal operations like Forming, Bending, etc. and fabricating models like Trays, funnels, etc.

CO - PO – PSO matrices of course

PO/PSO CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
GE19121.1	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
GE19121.2	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
GE19121.3	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
GE19121.4	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
GE19121.5	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
Average	-	-	-	-	-	-	-	1.0	1.0	-	-	-	-	-	-

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation: “-“

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
MC19101	ENVIROMENTAL SCIENCE AND ENGINEERING	MC	3	0	0	0

Objectives:

- To understand the importance of natural resources, pollution control and waste management.
- To provide the students awareness on the current social issues and environmental legislations.

UNIT-I	NATURAL RESOURCES	9
Environment -definition - scope and importance - forest resources -use and overexploitation -water resources -use and over utilization - dams - benefits and problems - water conservation -energy resources - growing energy needs - renewable and non-renewableenergy sources - use of alternate energy sources -land resources -land degradation - role of an individual in conservation of natural resources		
UNIT-II	ENVIRONMENTAL POLLUTION	9
Definition - causes, effects and control measures of air pollution -chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, and ozone depletion- noise pollution -mitigation procedures - control of particulate and gaseous emission (Control of SO ₂ , NO _X , CO and HC). Water pollution - definition-causes-effects of water pollutants–marine pollution-thermal pollution-radioactive pollution-control of water pollution by physical, chemical and biological processes–waste water treatment-primary, secondary and tertiary treatment. Soil pollution: definition-causes-effects and control of soil pollution.		
UNIT-III	SOLID WASTE MANAGEMENT	9
Solid wastes - sources and classification of solid wastes -solid waste management options - sanitary landfill, recycling, composting, incineration, energy recovery options from wastes. Hazardous waste -definition -sources of hazardous waste-classification (biomedical waste, radioactive waste, chemical waste, household hazardous waste)-characteristics of hazardous waste ignitability (flammable) reactivity, corrosivity, toxicity -effects of hazardous waste -case study- Bhopal gas tragedy - disposal of hazardous waste-recycling , neutralization, incineration, pyrolysis, secured landfill - E-waste management -definition-sources-effects -electronic waste recycling technology.		
UNIT-IV	SOCIAL ISSUES AND THE ENVIRONMENT	9
Sustainable development -concept, components and strategies - social impact of growing human population and affluence, food security, hunger, poverty, malnutrition, famine - consumerism and waste products - environment and human health - role of information technology in environment and human health -disaster management– floods, earthquake, cyclone and landslide.		
UNIT-V	TOOLS FOR ENVIRONMENTAL MANAGEMENT	9
Environmental impact assessment (EIA) structure -strategies for risk assessment–EIS-environmental audit-ISO 14000- precautionary principle and polluter pays principle- constitutional provisions- - pollution control boards and pollution control acts- environmental protection act1986- role of non-government organizations- international conventions and protocols.		
Total Contact Hours		: 45

Course Outcomes:

On completion of the course, the students will be able to

- Be conversant to utilize resources in a sustainable manner.
- Find ways to protect the environment and play proactive roles.
- Apply the strategies to handle different wastes
- Develop and improve the standard of better living.
- Be conversant with tools of EIA and environmental legislation.

Text Book(s):

1	Benny Joseph, “Environmental Science and Engineering”, 2nd edition, Tata McGraw-Hill, New Delhi, 2008.
2	Gilbert M.Masters, “Introduction to Environmental Engineering and Science”, 2ndedition, Pearson Education, 2004.

Reference Books(s):	
1	Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt. Ltd, New Delhi, 2007.
2	ErachBharucha, "Textbook of Environmental Studies", 3rd edition, Universities Press, 2015.
3	G. Tyler Miller and Scott E. Spoolman, "Environmental Science", 15th edition, Cengage Learning India, 2014.
4	Rajagopalan, R, "Environmental Studies-From Crisis to Cure", 3rd edition, Oxford University Press, 2015.
5	De. A.K., "Environmental Chemistry", New Age International, New Delhi, 1996.
6	K. D. Wager, "Environmental Management", W. B. Saunders Co., USA, 1998.

CO - PO – PSO matrices of course

PO/PSO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
MC19101.1	3	2	3	2	1	3	3	2	1	1	1	1	1	1	1	
MC19101.2	3	3	3	2	2	3	3	3	2	1	2	2	1	2	2	
MC19101.3	3	3	3	2	2	3	3	3	2	1	2	1	1	2	1	
MC19101.4	3	3	3	2	2	3	3	2	2	1	2	2	1	2	2	
MC19101.5	2	2	3	1	1	3	3	1	1	2	1	1	1	1	1	
Average	2.8	2.6	3.0	1.8	1.6	3.0	3.0	2.2	1.6	1.2	1.6	1.4	1.0	1.6	1.4	

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation : “-“